

Difference between Thermoelectric Cooler and Generator

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1. Understanding Thermoelectric effect:

Thermoelectric effect is a phenomenon where:

- A. Temperature difference gives rise to an electric potential (Seebeck Effect).
- B. An electric potential creates a temperature difference (Peltier Effect).

2. Thermoelectric Cooler:

Thermoelectric cooler are “*Solid State Heat Pumps*” which **work on the basis of Peltier Effect**. When a Voltage is applied to the free ends of two dissimilar elements, a temperature difference is created.

A typical thermoelectric cooler (TEC) will consist of an array made up of multitude of p- and n- type semiconductor elements that act as the two dissimilar conductors. The array of elements is soldered between two ceramic plates, electrically in series and thermally in parallel.

As a DC current passes through one or more pairs of elements from n- to p-, there is a decrease in temperature at the junction ("cold side"), resulting in the absorption of heat from the environment. The heat is carried through the cooler by electron transport and released on the opposite ("hot") side as the electrons move from a high- to low-energy state. The Cold junction experiences the “cooling phenomenon” which makes it a cooler.

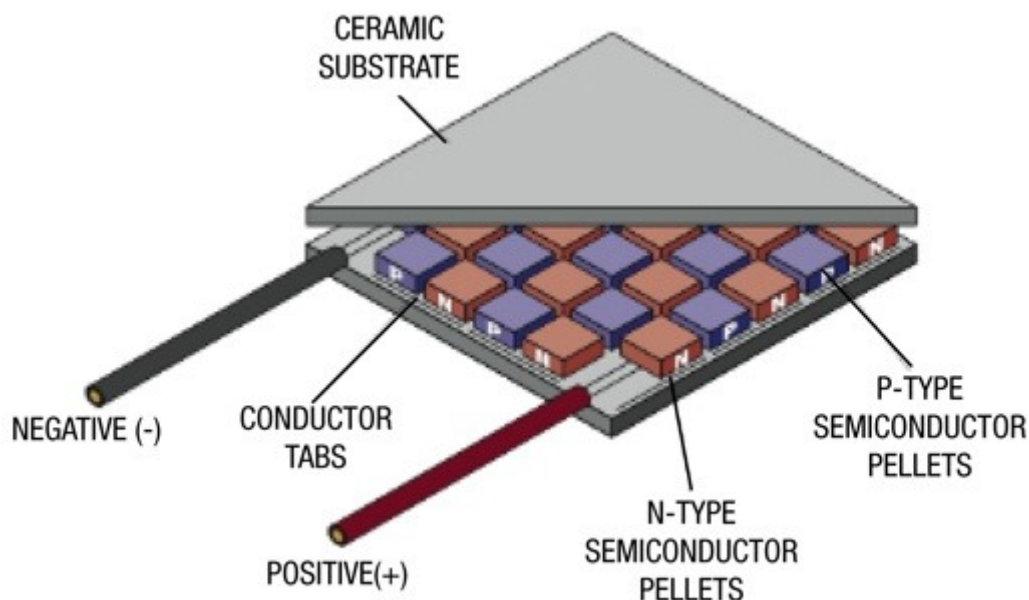


Figure 1

3. Thermoelectric Generator:

Thermoelectric Generators are “*Solid State Heat Engines*” which **work on the basis of Seebeck Effect**. That is when a temperature is applied across a thermoelectric material, a Electric potential is generated leading which can used a source of electrical power.

If the free charges are positive (the material is p-type), positive charge will build up on the cold side which will possess a positive potential. Similarly, negative free charges (n-type material) will produce a negative potential at the cold end.

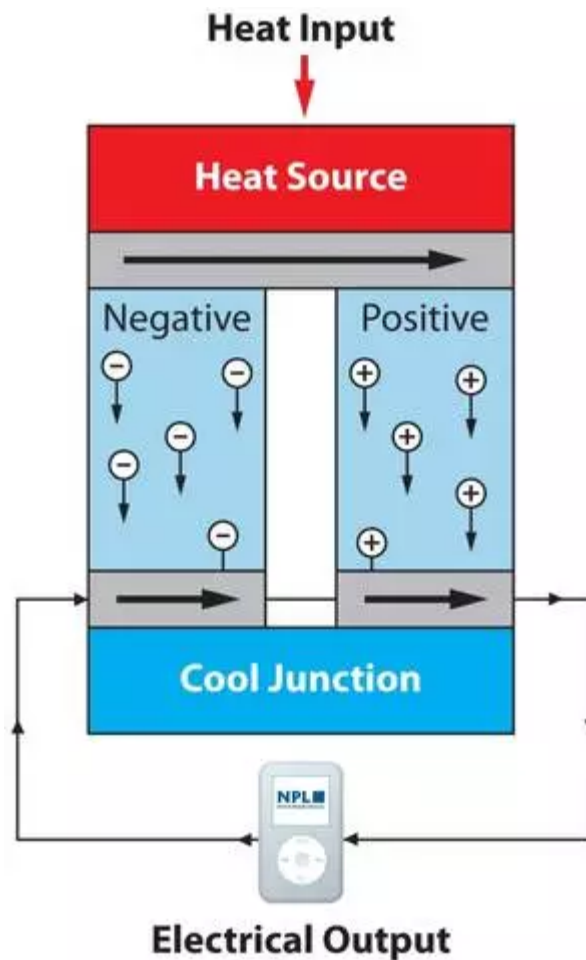


Figure 2

SUMMARY:

Thermoelectric Cooler (TEC)-Works on the basis of Peltier Effect- *Electric potential across Material leads to temperature difference.*

Thermoelectric Generator (TEG)- Works on the basis of Seebeck Effect- *Temperature difference across material leads to Electric Potential.*